NZ Applied Technologies

150 C New Boston Street
Woburn, MA 01801

Telephone: 617-935-2030
FAX: 617-935-2188
e-mail: 71344.637@compuserve.com

February 20, 1995

Dr. Clifford Lau
Office of Naval Research
Arlington, VA 22217

Dear Dr. Lau:

We are pleased to provide you with the following NZAT progress report on contract N00014-95-C-0015: High Density Optical Readout Nonvolatile RAMs.

Since the beginning of the contract, activities from several different directions have been coordinated by NZAT towards the goals of the this project. These activities include thin film growth by means of PE-CVD, design of the 64 bit optical read nonvolatile memory (ONF-RAMs), establishment of a differential ellipsometric system for electrooptic measurements of the thin films, and preparation for the fabrication of the memory devices.

Thin film materials of strontium barium niobate (SBN), lead lanthanum zirconate titanate (PLZT) and barium titanate (BT) are currently under evaluation as the storage media. PE-CVD and sputtering are our primary methods for the deposition of these thin film materials. The final material selected for the fabrication of the 64 bit memory device will be made based on its dielectric and electrooptic properties and its compatibility with Si technologies. We are seeking a low crystallization temperature and high yield process for the deposition of these materials. Such a process will not only fulfill the needs of this project but also make it feasible for the future development and commercialization of this technology.

In order to meet the above mentioned requirements for material processing, an improved PE-CVD system has been designed by NZAT. The system is currently being assembled. In order to improve the deposition rate of optical-quality oxide thin films, we have also designed a new single-liquid-source MOCVD system equipped with an inverted vertical reactor. Stagnation point flow in this new reactor well enables us to have a uniform growth of the films over a large area with higher efficiency than the rotating-disk reactor that was used in the Phase I program. The liquid delivery system and the vaporizer have been also redesigned to minimize the decomposition of source materials and to accurately

control the stoichiometry of the films. With these new approaches and refinements in its design, the new system is expected to produce high quality complex-oxide films suitable for the ONF-RAMs.

The design of the 64 bit test ONF-RAMs has been completed. The fabrication of the devices involves a three-step photolithography process: 1) patterning of the bottom electrodes; 2) exposure of the contact area; and 3) patterning of the top electrodes. Three photomasks have been made to be used in these three steps, respectively. Because of the chemical inertness of the platinum layer, a lift-off photolithography technique is being tested for the formation of the bottom electrodes.

The capability of characterizing the electrooptic effects in the complex-oxide thin film material is vital to the success of the this project. We are currently establishing an advanced measurement technique, i.e., reflective differential ellipsometry, for the electrooptic characterizations. This technique will allow us to measure the field-induced index change or birefringence in thin film materials in routine bases. Such measurements will be an invaluable tool in navigating our course of materials improvements throughout this project.

We greatly appreciate your support to NZAT.

Very sincerely,

Feiling Wang

Dr. Feiling Wang
Staff Scientist

OFFICE OF THE UNDER SECRETARY OF DEFENSE (ACQUISITION)
DEFENSE TECHNICAL INFORMATION CENTER
CAMERON STATION
ALEXANDRIA, VIRGINIA 22304-6145

IN REPLY REFER TO DTIC-OCC

SUBJECT: Distribution Statements on Technical Documents

TO: ONR/CODE 22
ATTN: AL DUMAS
ARLINGTON, VA 22217-5000

19951031 041

1. Reference: DoD Directive 5230.24, Distribution Statements on Technical Documents, 18 Mar 87.

2. The Defense Technical Information Center received the enclosed report (referenced below) which is not marked in accordance with the above reference.

"HIGH DENSITY OPTICAL READOUT NONVOLATILE RAMs"

N00014-95-C-0015

3. We request the appropriate distribution statement be assigned and the report returned to DTIC within 5 working days.

4. Approved distribution statements are listed on the reverse of this letter. If you have any questions regarding these statements, call DTIC's Cataloging Branch, (703) 274-6837.

FOR THE ADMINISTRATOR:

1 Encl

for GOPALAKRISHNAN NAIR
Chief, Cataloging Branch

FL-171
Jul 93

DISTRIBUTION STATEMENT A:

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

DISTRIBUTION STATEMENT B:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (Indicate Reason and Date Below). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT C:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS; (Indicate Reason and Date Below). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT D:

DISTRIBUTION AUTHORIZED TO DOD AND U.S. DOD CONTRACTORS ONLY; (Indicate Reason and Date Below). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT E:

DISTRIBUTION AUTHORIZED TO DOD COMPONENTS ONLY; (Indicate Reason and Date Below). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT F:

FURTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date Below) or HIGHER DOD AUTHORITY.

DISTRIBUTION STATEMENT X:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DOD DIRECTIVE 5230.25, WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (Indicate date of determination). CONTROLLING DOD OFFICE IS (Indicate Controlling DoD Office).

The cited documents has been reviewed by competent authority and the following distribution statement is hereby authorized.

A
(Statement)

OFFICE OF NAVAL RESEARCH
CORPORATE PROGRAMS DIVISION
ONR 353
800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

(Controlling DoD Office Name)

(Reason)

(Controlling DoD Office Address, City, State, Zip)

DEBRA T. HUGHES
DEPUTY DIRECTOR
CORPORATE PROGRAMS OFFICE

(Signature & Typed Name)

(Assigning Office)

25 SEP 1995
(Date Statement Assigned)